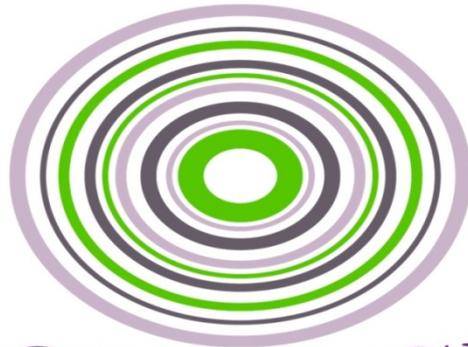


ISAAC NEWTON
ACADEMY



SCIENCE

AQA 

AQA Biology

Specification Checklists

Name: _____

Teacher: _____

Topic 1: Cell Biology

| <i>Can you...?</i> |  |  |  |
|---|---|---|---|
| B1.1 Cell Structure | | | |
| Name the main organelles of plant and animal cells (eukaryotic cells) | | | |
| Recall the relative size of bacterial cells (prokaryotic cells) | | | |
| Describe the difference in how the genetic material is found within eukaryotic and prokaryotic cells. | | | |
| Explain how the main sub-cellular structures, including the nucleus, cell membranes, mitochondria, cell wall and chloroplasts in plant cells and plasmids in bacterial cells are related to their functions | | | |
| Explain how the structure of different types of cell relate to their function in a tissue, an organ or organ system, or the whole organism. Including sperm cells, nerve cells and muscle cells in animals and root hair cells, xylem and phloem cells in plants. | | | |
| Describe cell differentiation | | | |
| Describe the differences in magnification and resolution between electron and light microscopes | | | |
| Define binary fission (biology only) | | | |
| Explain how to prepare an uncontaminated culture (biology only) | | | |
| B1.2 Cell division | | | |
| Recall that the nucleus of a cell contains chromosomes made of DNA molecules. Each chromosome carries a large number of genes. In body cells the chromosomes are normally found in pairs | | | |
| Give an overview of mitosis | | | |
| Understand that Cell division by mitosis is important in the growth and development of multicellular organisms | | | |
| Recognise and describe situations where mitosis is occurring. | | | |
| Define a stem cell | | | |
| Recall that stem cells from human embryos and adult bone marrow can be cloned and made to differentiate into many different types of human cells | | | |
| Name some conditions which may be helped by treatment with stem cells | | | |
| Discuss the ethical or religious objections and potential risk of stem cell use | | | |
| Recall that stem cells from meristems in plants can be used to produce clones of plants quickly and economically and describe possible uses | | | |
| B1.3 Transport in cells | | | |
| Explain how substances may move into and out of cells across the cell membranes via diffusion | | | |
| Describe diffusion | | | |
| Recall that some of the substances transported in and out of cells by diffusion are oxygen and carbon dioxide in gas exchange, and of the waste product urea from cells into the blood plasma for excretion in the kidney | | | |
| Describe factors that affect the rate of diffusion | | | |
| Recall that a single-celled organism has a relatively large surface area to volume ratio to allow sufficient transport of molecules into and out of the cell | | | |
| Explain how the small intestine and lungs in mammals, gills in fish, and the roots and leaves in plants, are adapted for exchanging materials | | | |
| List factors that increase the effectiveness of an exchange surface | | | |
| Describe osmosis | | | |
| Recall that active transport moves substances from a more dilute solution to a more concentrated solution (against a concentration gradient). This requires energy from respiration. | | | |
| Link the structure of a root hair cell to its function. | | | |
| Describe a use for active transport in both plants and animals. | | | |
| Explain the difference between diffusion, osmosis and active transport | | | |

Topic 2: Organisation

| <i>Can you...?</i> |  |  |  |
|---|---|---|---|
| 2.1 Principles of organisation | | | |
| Explain organisational hierarchy | | | |
| Define a cell, tissue, organ and organism | | | |
| 2.2 Animal tissues, organs and organ systems | | | |
| Know that digestive system is an example of an organ system in which several organs work together to digest and absorb food. | | | |
| Relate knowledge of enzymes to Metabolism | | | |
| Describe the structure function and optimum conditions for enzymes | | | |
| Define denaturation | | | |
| Recall the sites of production and the action of amylase, proteases and lipases. | | | |
| Know that digestive enzymes convert food into small soluble molecules that can be absorbed into the bloodstream. | | | |
| State that the products of digestion are used to build new carbohydrates, lipids and proteins. Some glucose is used in respiration. | | | |
| Recall where bile is made and stored and its pH and function | | | |
| State conditions that increase the rate of fat breakdown by lipase. | | | |
| Recall the structure and functioning of the human heart and lungs, including how lungs are adapted for gaseous exchange. | | | |
| Recall that the heart is an organ that blood around the body in a double circulatory system. The right ventricle pumps blood to the lungs where gas exchange takes place. The left ventricle pumps blood around the rest of the body. | | | |
| Name the major blood vessels | | | |
| Describe the structure of the lungs | | | |
| Explain natural and artificial pacemakers | | | |
| Name the three different types of blood vessel and explain how the structure of these vessels relates to their functions. | | | |
| Describe the components of blood and who they are adapted to function | | | |
| Describe coronary heart disease: a non-communicable disease | | | |
| State that health is the state of physical and mental wellbeing. | | | |
| Know that defects in the immune system mean that an individual is more likely to suffer from infectious diseases. | | | |
| Recall that immune reactions initially caused by a pathogen can trigger allergies such as skin rashes and asthma. | | | |
| Know that severe physical ill health can lead to depression and other mental illness. | | | |
| Explain the effect of lifestyle on some non-communicable diseases and that they can be caused by and their increased by the interaction of a number of factors, | | | |
| Recall that benign tumours and malignant tumours result from uncontrolled cell division. Malignant tumour cells are cancers. | | | |
| Know lifestyle risk factors for various types of cancer including smoking, obesity, common viruses and UV exposure. There are also genetic risk factors for some cancers. | | | |
| 2.3 Plant tissues, organs and systems | | | |
| Know the function of epidermal tissues palisade mesophyll, spongy mesophyll, xylem and phloem and meristem tissue | | | |
| Describe the structures of tissues in the leaf and relate to their functions | | | |
| Explain how root hair cells are adapted for the efficient uptake of water and mineral ions | | | |
| Know the structure and function of xylem tissue. | | | |
| Define factors which affect the rate of transpiration | | | |
| Explain the role of stomata and guard cells | | | |

| | | | |
|---|---|---|---|
| Explain the role of phloem tissue and name this process | | | |
| Can you...? | 😊 | 😐 | 😞 |
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Topic 3: Infection and Response

| Can you...? |  |  |  |
|---|---|---|---|
| 3.1 Communicable diseases | | | |
| Explain how diseases caused by viruses, bacteria, protists and fungi are spread in animals and plants. | | | |
| Define the term pathogen | | | |
| Explain how bacteria and viruses may reproduce in the body and why they make you feel ill | | | |
| Give examples of how the spread of diseases can be reduced | | | |
| Know that Measles is a viral disease and describe the symptoms | | | |
| Explain the effects of HIV and how it is transmitted | | | |
| Describe tobacco mosaic virus (TMV) | | | |
| Know that Salmonella food poisoning is spread by bacteria ingested in food, or on food prepared in unhygienic conditions. | | | |
| Describe the symptoms of salmonella food poisoning | | | |
| Know how Gonorrhoea is transmitted and how its spread can be reduced. | | | |
| State the cause of Gonorrhoea and describe the symptoms and how it is treated | | | |
| Describe rose black spot and state its cause | | | |
| Know how rose black spot is spread in the environment and how it can be treated | | | |
| Describe malaria and state its cause | | | |
| Know how malaria is spread and how to reduce the spread of the disease | | | |
| Define some of body's natural defences to infection | | | |
| Explain the role of white blood cells | | | |
| Describe the process of vaccination | | | |
| Explain "herd immunity" | | | |
| State what antibiotics can treat and explain the development of antibiotic resistance bacteria | | | |
| Define painkillers | | | |
| Explain why it is difficult to develop drugs that kill viruses | | | |
| Know that traditionally drugs were extracted from plants and microorganisms and give some common examples including who discovered Penicillin and from what | | | |
| State that most new drugs are synthesised by chemists in the pharmaceutical industry. However, the starting point may still be a chemical extracted from a plant. | | | |
| For new medicinal drugs explain the stages in preclinical and clinical trial | | | |
| Define placebo | | | |
| Explain double blind trials | | | |
| 3.2 Monoclonal antibodies (biology only) | | | |
| Explain how they are produced | | | |
| Name uses of monoclonal antibodies both diagnostic and therapeutic | | | |
| 3.3 Plant disease (biology only) | | | |
| Know how plant disease is detected and identified | | | |
| Plants can be infected by a range of viral, bacterial and fungal pathogens as well as by insects. | | | |
| Plants can be damaged by a range of ion deficiency conditions: | | | |
| Explain plant physical defence responses | | | |
| Explain chemical plant defence responses | | | |
| Explain plant mechanical defence adaptations. | | | |

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Topic 4: Bioenergetics

| Can you...? |  |  |  |
|--|---|---|---|
| 4.1 Photosynthesis | | | |
| State the word equation for photosynthesis | | | |
| Write a balanced symbol equation for photosynthesis (HT Only) | | | |
| Explain where the energy for photosynthesis comes from | | | |
| State the factors that affect the rate of photosynthesis | | | |
| Explain limiting factors (HT only) | | | |
| Explain graphs of photosynthesis rate involving two or three factors and decide which is the limiting factor (HT only) | | | |
| Understand and use inverse proportion – the inverse square law and light intensity in the context of photosynthesis. (HT only) | | | |
| Explain how limiting factors are important in the economics of enhancing the conditions in greenhouses to gain the maximum rate of photosynthesis while still maintaining profit (HT only) | | | |
| State the six uses of glucose by plants | | | |
| Know how plant use nitrate ions that are absorbed from the soil. | | | |
| 4.4.2 Respiration | | | |
| Compare the processes of aerobic and anaerobic respiration with regard to the need for oxygen, the differing products and the relative amounts of energy transferred. | | | |
| Define aerobic and anaerobic respiration | | | |
| State that reactions which transfer energy to the environment are exothermic reactions | | | |
| Name three things organisms need energy for | | | |
| State the word equation for aerobic respiration | | | |
| Write a balanced symbol equation for aerobic respiration (HT only) | | | |
| State the word equation for anaerobic respiration in muscles | | | |
| The energy transferred supplies all the energy needed for living processes. | | | |
| State the word equation for anaerobic respiration in plant and yeast cells | | | |
| Write a balanced symbol equation for anaerobic respiration in yeast and plant cells (HT only) | | | |
| State that anaerobic respiration in yeast cells is called fermentation and has economic importance in the manufacture of bread and alcoholic drinks | | | |
| Explain why anaerobic respiration takes place in muscles during exercise | | | |
| Explain muscle fatigue and oxygen debt | | | |
| Define the role of the liver in the removal of lactic acid (HT only) | | | |
| Define metabolism | | | |
| The energy transferred by respiration in cells is used by the organism for the continual enzyme controlled processes of metabolism that synthesise new molecules. | | | |
| State five metabolic processes | | | |

Topic 5: Homeostasis and Control

| Can you...? |  |  |  |
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| 4.5.1 Homeostasis | | | |
| Define homeostasis | | | |
| Name three levels maintained by homeostasis | | | |
| State that automatic control systems may involve nervous responses or chemical responses | | | |
| Define receptors, coordination centres and effectors | | | |
| 5.2 The human nervous system | | | |
| Explain how the structure of the nervous system is adapted to its functions | | | |
| State the main function of the nervous system | | | |
| Describe how information from receptors is carried to the brain to coordinate the response | | | |
| Describe the roles of sensory neurones, relay neurones, motor neurones, synapses and effectors in a reflex action, and state that reflex actions are automatic and rapid | | | |
| Identify the cerebral cortex, cerebellum is concerned and medulla on a diagram of the brain (Biology only) | | | |
| Describe the function of the cerebral cortex, cerebellum is concerned and medulla (Biology only) | | | |
| Describe how neuroscientists have been able to map the regions of the brain to particular functions. (biology only) (HT only) | | | |
| Relate the structures of the eye to their functions, including accommodation to focus on near or distant objects and adaptation to dim light. (biology only) | | | |
| Explain the function of the retina, the optic nerve, the sclera, the iris and the ciliary muscles (biology only) | | | |
| Describe myopia and hyperopia and how they are treated with spectacle lenses (biology only) | | | |
| Describe how new technologies and used to treat eye defects (biology only) | | | |
| Interpret ray diagrams demonstrating how spectacle lenses correct myopia and hyperopia. (biology only) | | | |
| Explain mechanisms to lower or raise body temperature in a given context. (HT only) | | | |
| 5.3 Hormonal coordination in humans | | | |
| Define hormones and their rate of effect | | | |
| Describe the functions and main organs of the endocrine system | | | |
| Describe the function of the pituitary gland | | | |
| Identify the position of the pituitary gland, pancreas, thyroid, adrenal gland, ovaries and testes on a diagram of the human body | | | |
| Explain the role of the pancreas and insulin in the control of blood glucose concentration | | | |
| Compare Type 1 and Type 2 diabetes and explain how they can be treated | | | |
| Recall that If the blood glucose concentration is too low, the pancreas produces glucagon that causes glycogen to be converted into glucose and released into the blood. (HT only) | | | |
| Explain how glucagon interacts with insulin to control blood glucose (sugar) levels in the body (HT only) | | | |
| Explain how the body maintains water and nitrogen balance in the body | | | |
| Recall that excess water, ions and urea are removed via the kidneys in the urine. | | | |
| Explain the role of the liver in deaminated to form ammonia and that ammonia is toxic and so it is immediately converted to urea for safe excretion. (HT only) | | | |
| The kidneys produce urine by filtration of the blood and selective reabsorption of useful substances such as glucose, some ions and water | | | |
| Describe the role of ADH in controlling the water level in the body (HT only) | | | |
| Know how people who suffer from kidney failure may be treated. | | | |
| State that during puberty reproductive hormones cause secondary sex characteristics to develop. | | | |
| State that testosterone is the main male reproductive hormone produced by the testes and it stimulates sperm production. | | | |
| Explain the interactions of hormones in the control of the menstrual cycle. (HT only) | | | |

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| Evaluate the different hormonal and non-hormonal methods of contraception. | | | |
| Explain the use of hormones to treat infertility (HT only) | | | |
| State some problems with fertility treatment | | | |
| Explain negative feedback (HT only) | | | |
| State two hormones that are controlled by negative feedback and their function (HT only) | | | |
| 4.5.4 Plant hormones (biology only) | | | |
| Explain how plants use hormones to coordinate and control growth in response to light and gravity (Biology only) | | | |
| Describe the role of gibberellins and ethane in plants (Biology only)(HT only) | | | |
| Describe some uses of plant hormones in agriculture and horticulture (Biology only)(HT only) | | | |

Topic 6: Inheritance, Variation and Evolution

| Can you...? |  |  |  |
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| 4.6.1 Reproduction | | | |
| Describe sexual and asexual reproduction | | | |
| Name the sex cells in plants and animals | | | |
| Explain meiosis to form gametes | | | |
| Recall that gametes join at fertilisation to restore the normal number of chromosomes. | | | |
| Explain how cell divide by mitosis. | | | |
| List some advantages and disadvantages of sexual reproduction (biology only) | | | |
| List some advantages and disadvantages of asexual reproduction (biology only) | | | |
| Recall that some organisms reproduce by both methods depending on the circumstances. | | | |
| Define a gene | | | |
| Define the term genome | | | |
| Discuss the importance of understanding the human genome | | | |
| Recall the four bases and their complimentary pairing (biology only) | | | |
| Explain how the bases code for proteins (biology only) | | | |
| Describe the DNA polymer (biology only) | | | |
| Explain how a change in DNA structure result in a change in the protein synthesised (Bio HT only) | | | |
| Explain how proteins are synthesised on ribosomes, according to a template (Bio HT only) | | | |
| Recall that when the protein chain is complete it folds up to form a unique shape. Which enables the proteins to do their job as enzymes, hormones or forming structure (Bio HT only) | | | |
| Recall that mutations occur continuously and most do not alter the protein . (Bio HT only) | | | |
| (HT only) Not all parts of DNA code for proteins. Non-coding parts of DNA can switch genes on and off, so variations in these areas of DNA may affect how genes are expressed. | | | |
| Explain the difference between genotype and phenotype | | | |
| Explain dominant and recessive alleles | | | |
| Define homozygous and heterozygous. | | | |
| Recall that most characteristics are a result of multiple genes interacting. | | | |
| Understand family trees | | | |
| Use a Punnett square diagram to predict the outcome of a monohybrid cross | | | |
| Name an Inherited disorder caused by a dominant allele | | | |
| Name an Inherited disorder caused by a recessive allele | | | |
| Recall the number of pairs of chromosomes in an ordinary human body | | | |
| State the pairs of chromosomes that carries the genes that determine sex. | | | |
| Explain single gene inheritance and carry out a genetic cross to show sex inheritance. | | | |
| 6.2 Variation and evolution | | | |
| Describe variation | | | |
| Give causes of variation | | | |
| Explain how explain how evolution occurs through natural selection | | | |
| Describe selective breeding | | | |
| Define some chosen characteristics for selective breeding | | | |
| Explain the problems with 'inbreeding' | | | |
| Describe genetic engineering | | | |
| Give examples of uses of genetic engineering | | | |
| Define GM crop and give examples | | | |
| State some concerns about GM crops | | | |

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| Recall the possibility of genetic modification to overcome some inherited diseases. | | | |
| Explain plant cloning tissue culture and cuttings (biology only) | | | |
| Explain animal cloning by embryo transplants and adult cell cloning (biology only) | | | |
| 4.6.3 The development of understanding of genetics and evolution | | | |
| Explain theory of evolution by natural selection proposed by Charles Darwin (biology only) | | | |
| State reason why the theory of evolution by natural selection was only gradually accepted | | | |
| Recall the theory of Jean-Baptiste Lamarck | | | |
| Summarise the work of Alfred Russel Wallace into speciation (biology only) | | | |
| State some cause for new species to arise (biology only) | | | |
| Recall some history of the understanding of genetics including: (biology only) <ul style="list-style-type: none"> • In the mid-19th century Gregor Mendel carried out breeding experiments on plants. • In the late 19th century behaviour of chromosomes during cell division was observed. • the structure of DNA was determined in the mid-20th century | | | |
| Understand why the importance of Mendel's discovery was not recognised until after his death. | | | |
| State evidence for evolution by natural selection | | | |
| Define fossils and explain how they are formed | | | |
| Explain why there are no fossils of many early forms of life | | | |
| Recall that we can learn from fossils how much or how organisms have changed | | | |
| List some possible causes of extinction | | | |
| Explain the emergence of antibiotic resistant bacteria | | | |
| Recall that MRSA is resistant to antibiotics. | | | |
| Describe how to reduce the rate of development of antibiotic resistant strains | | | |
| 6.4 Classification of living organisms | | | |
| Describe the Linnaeus system to classify living things and name the levels. | | | |
| State that organisms are named by the binomial system of genus and species. | | | |
| Know that new models of classification have been proposed based on improved analysis | | | |
| Define the 'three-domain system' developed by Carl Woese. | | | |
| Understand that evolutionary trees are a method used by scientists to show how they believe organisms are related. | | | |

Topic 7: Ecology

| Can you...? |  |  |  |
|---|---|---|---|
| 7.1 Adaptations, interdependence and competition | | | |
| Suggest the factors for which organisms are competing in a given habitat | | | |
| Suggest how organisms are adapted to the conditions in which they live | | | |
| Define an ecosystem | | | |
| Define interdependence | | | |
| Explain what is meant by a “stable community” | | | |
| Explain how a change in an abiotic factor would affect a given community | | | |
| List abiotic factors | | | |
| Explain how a change in a biotic factor might affect a given community | | | |
| List biotic factors | | | |
| Explain how organisms are adapted to live in their natural environment | | | |
| Define an extremophile | | | |
| 7.2 Organisation of an ecosystem | | | |
| Define a producer, primary consumers, secondary consumers and tertiary consumers | | | |
| Construct food chains | | | |
| Explain the use of transects and quadrats | | | |
| Explain why, in a stable community, the numbers of predators and prey rise and fall in cycles | | | |
| Recall the carbon cycle | | | |
| Recall the water cycle | | | |
| Explain the role of microorganisms in cycling materials through an ecosystem. | | | |
| State factors which affect the rate of decay(biology only) | | | |
| Recall that biogas generators can be used to produce methane gas as a fuel. | | | |
| Evaluate the impact of environmental changes on the distribution of species in an ecosystem given appropriate information (biology only) (HT only) | | | |
| State some environmental changes | | | |
| 7.3 Biodiversity and the effect of human interaction on ecosystems | | | |
| Define biodiversity | | | |
| State the benefit of ensuring a great biodiversity | | | |
| Explain how human activities are reducing biodiversity | | | |
| Understand that rapid growth in the human population and an increase in the standard of living mean that increasingly more resources are used and more waste is produced. Unless waste and chemical materials are properly handled, more pollution will be caused | | | |
| Explain how pollution can occur on land, in air and in water | | | |
| State how humans reduce the amount of land available for other animals | | | |
| Explain the destruction of peat bogs | | | |
| State why large-scale deforestation in tropical areas has occurred | | | |
| List the consequences of deforestation | | | |
| Describe global warming | | | |
| State the biological consequences of global warming | | | |
| Explain how humans are trying to reduce these negative effects | | | |
| 7.4 Trophic levels in an ecosystem (biology only) | | | |
| List the trophic levels (biology only) | | | |
| State the role of decomposers (biology only) | | | |
| Construct a pyramid of biomass (biology only) | | | |
| Explain how the loss of biomass at each trophic level affects the number of organisms at each level. (biology only) | | | |
| Recall that only approximately 10% of the biomass from each trophic level is transferred to the | | | |

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| level above it. (biology only) | | | |
| State reason for losses of biomass | | | |
| 4.7.5 Food production (biology only) | | | |
| List some factors affecting food security (biology only) | | | |
| Explain 'Factory farming' to restrict energy transfer from food animals to the environment. (biology only) | | | |
| Explain sustainable fishing security (biology only) | | | |
| Understand that modern biotechnology techniques enable large quantities of microorganisms to be cultured in industrially controlled vats for food. (biology only) | | | |
| State that the fungus <i>Fusarium</i> is useful for producing mycoprotein, (biology only) | | | |
| Recall that GM bacterium produces human insulin. (biology only) | | | |